

Appl. No. 10/664,585
Amdt. Dated February 3, 2005
Reply to Office Action of November 4, 2004

Attorney Docket No. 81751.0066
Customer No.: 26021

REMARKS/ARGUMENTS

This application has been carefully reviewed in light of the Office Action dated November 4, 2004. Claims 1, 5-7, 9-11 and 21 remain in this application. Claims 1 and 21 are the independent claims. Claims 1 and 7 are amended. Claims 2-4, 8, and 12-20 are cancelled without prejudice. Claim 21 is added. It is believed that no new matter is involved in the amendments or arguments presented herein. Reconsideration and entrance of the amendment in the application are respectfully requested.

Non-Art-Based Rejections

Claim 5 was rejected under 35 USC §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicant regards as the invention.

According to the Office Action, Claim 5 is indefinite because "the instant invention discloses that the outer lead has a second sloping section sloping downward and outward from a higher end of the sloping section." (*See, Office Action, Page 2*). However, Claim 1, as amended, discloses an inner lead having a sloping section sloping upward and outward and an outer lead extending outward from the sealing section. Claim 5 discloses the inner lead having a second sloping section sloping downward and outward from a higher end of the sloping section. (*See, Specification, Figure 9*). Accordingly, Claim 5 is believed to comply with the requirement of §112, second paragraph. Hence, Applicant respectfully requests reconsideration of Claim 5.

Art-Based Rejections

Claims 1, 3-6, 8 and 10-11 were rejected under 35 USC §102(e) over USPN 6,316,727 (Liu). Claims 2 and 7 were rejected under 35 USC §103(a) over Liu in

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view of USPN 6,169,363 (Sakamoto). Claim 9 was rejected under 35 USC §103(a) over Liu in view of USPN 6,143,981 (Glenn). Applicant respectfully traverses these rejections and submits that the claims herein are patentable in light of the clarifying amendments above and the arguments below.

The Lui Reference

Liu is directed to a multi-chip package having a first chip, a second chip, a lead frame, a plurality of wires, and a packaging material. The first chip has a plurality of first bonding pads. The second chip has a plurality of second bonding pads. The lead frame has a die pad and a plurality of leads. The leads have an inner portion and an outer portion. The plurality of wires respectively couple the first bonding pads and the second bonding pads to the inner portion of the leads. The first chip, the second chip, and the inner portion of the leads are all sealed within the packaging material. According to Liu, by changing the design of the lead frame to a downward slope, performance and density of the package can be enhanced. (*See, Liu, Abstract; Col. 1, lines 50-67; Figure 2*).

The Sakamoto Reference

Sakamoto is directed to a semiconductor device packaged in a plastic package and having leads horizontally extending along the bottom surface of the plastic package. According to Sakamoto, mechanical strength is enhanced for connection conducted by soldering the leads and a conductive object, such as wirings, with which the leads are mechanically and electrically connected. Moreover, according to Sakamoto, the invention is based on a concept that the surface area for soldering is increased by making the end surface of a lead non-flat, uneven, pulsating, or saw-tooth shaped. (*See, Sakamoto, Col. 1, line 66 to Col. 2, line 5*).

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The Glenn Reference

Glenn is directed to plastic packages for housing an integrated circuit die and lead frames. According to Glenn, the package provides a rectangular metal lead frame with a substantially planar die pad positioned with and connected to the frame. A plurality of finger-like rectangular tabs extend from the frame toward the die pad without contacting the die pad. The die pad and tabs have peripheral side surfaces which include a reentrant portion(s) and asperities that enhance the connection of the die pad and tabs to the plastic encapsulating material. (See, *Glenn, Col. 1, line 57 to Col. 2, line 8*).

The Claims Are Patentable Over the Cited References

The present invention is generally related to a semiconductor package technology including manufacture of a semiconductor device.

As defined by amended independent Claim 1, a semiconductor device includes an inner lead having a sloping section sloping upward and outward, a die pad, and a semiconductor chip having an electrode and bonded to the die pad. A wire electrically connects the inner lead to the electrode. A sealing section seals the inner lead, the semiconductor chip, and the wire. An outer lead extends outward from the sealing section. The wire is bonded to the sloping section of the inner lead.

Independent Claim 1 has been amended to include the subject matter of Claim 2 and to distinguish over the applied references. The applied references do not disclose or suggest the above features of the present invention as defined by amended independent Claim 1. In particular, the applied references do not disclose or suggest, "an inner lead having a sloping section sloping upward and outward" and "wherein the wire is bonded to the sloping section of the inner lead," as required by amended independent Claim 1.

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Liu discloses a wire bonded on an end section extending horizontally from the sloped section of the inner lead. (*See, Liu, Figure 2*). Liu does not disclose a wire bond on the sloping section sloping upward and outward. The ancillary Sakamoto reference does not remedy the deficiencies of the applied Liu reference. Sakamoto is directed to a semiconductor device packaged in plastic package. (*See, Sakamoto, Abstract*). Sakamoto discloses leads having sloping section sloping downward and outward, and the wire bonded on the downward sloping section. Accordingly, the combination of Liu and Sakamoto does not disclose or suggest the features of the present invention as required by amended independent Claim 1.

In contrast, the present invention discloses that the inner lead 30 of the semiconductor device 1 includes a sloping section 32, which slopes upward toward the outside of the semiconductor device 1. As shown in FIG. 1, the end section 34 of inner lead 30 may be disposed at a position lower than the base section of the inner lead 30. The inner lead 30 of the semiconductor device 1 includes a part 38, which extends from the outer lead 40 in the horizontal direction, and the end section 34, which extends from the sloping section 32 in the horizontal direction. The end section 34 may be disposed at a position lower than the electrode 12 of the semiconductor chip 10. The part 38, which extends in the horizontal direction, may be disposed at a position higher than the top of the loop of the wire 16. The semiconductor device 1 includes the wire 16 for electrically connecting the electrode 12 with the inner lead 30. (*See, Specification, Page 6, line 24 to Page 7, line 6*).

Moreover, the present invention discloses that the wire 16 may be bonded to the inner lead 30 at a position lower than the electrode 12 of the semiconductor chip 10. In one aspect, the bonding position of the wire 16 and the inner lead 30 may be lower than the electrode 12. The wire 16 may be bonded to the end section 34 of the inner lead 30. The height of the loop of the wire 16 can be secured by allowing the

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bonding position of the wire 16 and the inner lead 30 to be lower than the electrode 12. Therefore, the wire 16 can be prevented from coming in contact with an inner lead other than the target inner lead, whereby a highly reliable semiconductor device can be provided. The bonding position of the wire 16 and the inner lead 30 may be lower than the surface (active surface) of the semiconductor chip 10 on which the electrode is formed. (*See, Specification, Page 7, lines 7-18*).

The ancillary Glenn reference does not remedy the deficiencies of Lui, Sakamoto, or any combination thereof. Glenn is directed to an integrated circuit die package and methods and lead frames of the package. (*See, Glenn, Abstract*). Glenn does not disclose leads with sloping sections. (*See, Glenn, Figure 9*).

Since Lui does not disclose or suggest the features of the present invention as required by amended independent Claim 1, and since Sakamoto and Glenn do not remedy the deficiencies of Lui, these references cannot be said to anticipate nor render obvious the invention which is the subject matter of amended independent Claim 1. Accordingly, independent Claim 1, as amended, is believed to be in condition for allowance and such allowance is respectfully requested.

The remaining Claims 5-7 and 9-11 depend either directly or indirectly from amended independent Claim 1 and recite additional features of the invention which are neither disclosed nor fairly suggested by the applied references. Thus, the remaining Claims 5-7 and 9-11 are also believed to be in condition for allowance and such allowance is respectfully requested.

Moreover, new Claim 21 recites additional features of the invention which are neither disclosed nor fairly suggested by the applied references. Thus, new Claim 21 is believed to be in condition for allowance and such allowance is respectfully requested.

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Conclusion

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (213) 337-6809 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,
HOGAN & HARTSON L.L.P.

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